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BEAN GROWING

IN NORTHERN IDAHO EASTERN WASHINGTON & EASTERN OREGON

BEAN GROWING can be successfully conducted in certain districts of northern Idaho, eastern Washington, and eastern Oregon without seriously interfering with wheat growing, the major industry of these districts.

Thousands of acres now lying idle as summer fallow are well adapted to bean growing, and at slight additional expense with practically the same equipment they can be made to produce about 800 pounds of beans per acre. Experience has shown that about as good cereal crops can be grown after beans as after ordinary summer fallow. Cultivation of the bean crop replaces the work necessary to care for the summer fallow and leaves the soil in excellent condition for planting winter wheat. Beans are usually harvested in ample time to permit fall seeding.

There has been a substantial upward trend in the production and consumption of dry beans since the beginning of the World War, and production can readily be expanded beyond our domestic needs. To stabilize the industry, the acreage devoted to the different classes of beans in the several producing areas should be adjusted carefuly to meet the market demands.

This bulletin describes the methods followed by the most successful bean growers, showing that, where moisture for crop production is present and no frosts occur between May 20 and September 15, beans have been incorporated into the cropping system with profit.

Washington, D. C. Issued January, 1927

BEAN GROWING IN NORTHERN IDAHO, EASTERN WASHINGTON, AND EASTERN OREGON[1]

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DISTRICT SUITED TO BEAN CULTURE

THE ARABLE LAND of northern Idaho, eastern Washington, and eastern Oregon has been devoted almost exclusively to the production of wheat, oats, and barley for 35 to 40 years. Because of the introduction of weed pests soon after the land was brought into cultivation, and because of the lack of enough available nitrogen in the soil to give satisfactory yields under continuous cropping, it was found unprofitable to grow a crop of grain each year.

Many of the settlers had come from the Willamette Valley, Oreg., where wheat and oats were grown by summer fallowing the land every second or third year. They naturally turned to that system of farming as a solution of their soil and weed problems, and the growing of small grain by the summer-fallow method is still the general practice among the farmers of this region. Under this system of farming from one-third to one-half of the land lies idle each season as clean cultivated summer fallow.

The districts lying along the foothills of the Craig Mountains and adjacent to the canyons of the Clearwater and Potlatch Rivers in Nez Perce, Lew, and Latah Counties, Idaho, and along the foothills of the Blue Mountains in Umatilla County, Oreg., and Walla Walla, Columbia, and Garfield Counties, Wash., are well adapted to the production of beans. There are also a few districts in Whitman, Spokane, and Sevens Counties, Wash., where the climatic conditions are favorable for bean culture. Though only a limited area is especially adapted to this crop, a careful study of all the details of its production shows that there are thousands of acres now lying idle each year as summer fallow which might be used for producing beans as a row-tilled crop.

FACTORS FAVORING BEAN PRODUCTION

Two factors are largely necessary to the successful growing of beans: (1) The annual rainfall must be sufficient to produce a crop each year, and (2) the growing season from May 20 to September

[1] A part of this material was issued in 1913 as Farmers' Bulletin 561, by L. W. Fluharty. In 1917 and 1922 it was revised by Byron Hunter and reissued as Farmers' Bulletin 907. This issue is a further revision with much added material and supersedes Farmers' Bulletin 907.

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15 must be approximately free from frosts. Because they are near the mountains these districts receive enough rain to grow beans where proper cultural methods are used.

The deep ravines leading down from the mountains in these districts give protection from frosts during the growing season by furnishing excellent air drainage. Danger from frosts increases with the elevation, but air drainage is the principal regulating factor. In parts of Nez Perce County, Idaho, where the deep canyons furnish good air drainage, beans are being grown successfully at an elevation of 3,000 feet. In other parts of the same county having a lower elevation, but poor air drainage, this crop can not be grown on account of the late spring and early fall frosts.

Three further factors, largely within the control of the farmer, affect the success of the bean crop: (1) The quantity of moisture stored in the soil at the time of planting, (2) the methods used in growing and harvesting the crop, and (3) the presence of the nodule-forming bacteria in the soil.

ADVANTAGES OF GROWING BEANS

In parts of Latah, Nez Perce, and Lewis Counties, Idaho, beans have been grown for 25 years, usually in alternation with wheat, and production here passed the experimental stage long ago. Experience has shown that about as good cereal crops can be grown after beans as after an ordinary summer-fallow. Cultivation of the bean crop replaces the work necessary to care for the summer-fallow and leaves the soil in excellent condition for planting winter wheat. Beans are usually harvested in ample time to permit fall seeding.

Beans do not seriously compete with wheat for labor and the two crops can be grown with practically the same equipment. Approximately $270 worth of extra machinery is needed to plant, harvest, and cultivate from 70 to 80 acres of beans instead of cultivating the land as summer-fallow. With the wage for man and horse labor and the price of bean seed that prevailed in 1925 it cost about $11 per acre more to plant, cultivate, and harvest a bean crop than to perform the tillage operations necessary to summer-fallow the land. The average price that the northern Idaho growers received for the 1925 crop was about 4 cents per pound, and from 1922 to 1925 the average price was around 4.9 cents per pound. At 4 cents per pound and with a yield of 800 pounds the gross value of the bean crop per acre would be about $32. This would indicate that beans and wheat were about $21 per acre more profitable than wheat and summer-fallow, the yield of wheat after beans and summer-fallow being the same.

MAINTAINING SOIL PRODUCTIVITY

The soils of the bean-growing districts are generally well supplied with the mineral elements necessary for plant growth. Under such conditions the maintenance of soil fertility will depend almost entirely on keeping up the organic matter of the soil. This is not easily accomplished when beans and the cereal crops are grown exclusively. In fact, experience has thoroughly shown that the organic matter of the soil is gradually becoming depleted under the two-year rotation of wheat and beans.

The permanency of the agriculture of the bean-growing districts, to which this bulletin is applicable, would be increased materially

by introducing either biennial sweet clover or alfalfa into the cropping system. Devoting approximately one-third of the tillable land to sweet clover, one-third to beans, and one-third to the small grains, and keeping enough livestock to utilize the clover, would aid greatly in restoring the proper organic content of the soil and, in a long-time program, should be more profitable than the two-year rotation—wheat and beans.

Plowing under of stubble and partially decayed bean and wheat straw will do much toward keeping the soil productive. The partially decayed straw should be scattered rather thinly over the grain stubble in the fall. It should be thoroughly worked into the surface soil with a sharp disk harrow before it is plowed under. The disking causes the straw to mix thoroughly with the soil at the time of plowing instead of forming a layer in the bottom of the furrow. The straw may also be spread thinly on winter wheat as soon as the young plants have become well established.

METHODS OF PRODUCTION

PREPARING THE SEED BED

Success of the bean crop depends largely on the thorough preparation of the seed bed. Beans are not planted until danger of the late spring frosts has passed, around the 1st of June. This encourages slighting the tillage of the bean land until after the rush of planting all the other crops. To guard against such neglect, bean growers should have two very definite aims in view in handling the soil prior to planting the crop:

1. The maximum amount of moisture should be stored in the soil at the time the bean crop is planted, because, as a rule, the rainfall that comes after planting time is rather scant. Moisture is lost from the soil in two ways: (1) It is consumed rapidly and in large quantities when volunteer wheat and weeds are allowed to make considerable growth in the spring before the land is prepared for planting beans, and (2) moisture is lost by evaporation in the spring as soon as the surface of the soil becomes dry. Loss from a heavy growth of volunteer wheat and weeds is much greater than loss from evaporation. The cultivation that is necessary to keep the weeds under control is usually sufficient to maintain the surface mulch for preventing evaporation.

2. Tillage operations before planting the crop should (1) destroy at least two crops of weeds and (2) prepare a moist, mellow, firm seed bed in which the seed will germinate quickly. With this accomplished, the handwork and cultivation necessary to grow the crop and keep it clean will be materially reduced.

Absorption of the winter precipitation is one of the first factors to be considered in planning the preparation of the seed bed for beans. Those who have studied the subject are generally agreed that land that has produced a crop of wheat will absorb the winter precipitation more readily, in the majority of cases, if the stubble is left undisturbed until spring than if it is disked or plowed in fall.

The rush of the spring work on many farms, however, makes it advisable to do considerable plowing in the fall as soon as the soil has become moist enough to be worked. Bean land that is plowed in the fall is left rough as it comes from the plow until spring. When dry enough in the spring, the soil is stirred once or twice with a disk or other suitable implement. A loose surface mulch is then

maintained until planting time to destroy weeds, reduce surface evaporation, and prepare the seed bed. The amount and kind of cultivation required each year depend largely on the weather conditions.

Many of the most successful bean growers of northern Idaho start the spring work by thoroughly disking the land to be planted to beans. No further tillage is then given until the seeding of the small-grain crops is completed. Attention is then turned to the bean land, and its condition determines whether it is harrowed before it is plowed. Harrowing is usually good practice, but it is not done unless the advantages are very evident. The tillage given after the land is spring plowed depends much upon the weather and the dampness of the soil. If the weather is fair and the soil is sufficiently dry as it comes from the plow, the land may be harrowed immediately and packed with a corrugated roller or cultipacker. But if the weather is damp and the surface soil is rather wet as it comes from the plow, the harrowing and packing are postponed until the soil is in proper working condition.

PLANTING

TIME TO PLANT

The time of planting varies from May 20 to June 10, according as the season is early or late. When planted too early, cold weather, together with an excessive quantity of moisture in the soil, often causes the seed to decay before germination. Even if a good stand is obtained under such unfavorable conditions the crop usually develops and ripens very unevenly.

METHOD OF PLANTING

If the land to be planted is comparatively level and free from weeds and there is sufficient rainfall, the largest yields are obtained by planting the beans in rows 28 inches apart and dropping a bean every 2 to 3 inches in the row. If planted this way the beans will ripen a little earlier and more evenly and the quality will be more uniform. If the ground is so foul as to require extensive cultivation, the beans should be planted in checks with the hills 30 inches apart each way. About 7 beans should be planted in each hill. If planted in this way the beans can be cultivated in two directions. Land that will require only a medium amount of hoeing may be planted in rows 30 inches apart with hills about 15 inches apart in the rows. An average of 7 beans should be planted in each hill. The large-seed varieties require more pounds of seed per acre than those having small seed.

It is essential that the number of plants grown on a certain area be sufficient to maintain a proper balance between the soil moisture and the moisture requirements of the plants. If this balance is properly maintained the beans ripen evenly and a uniform crop is produced. In the sections where beans are being grown at present, from 6 to 8 seeds in each hill produce the proper number of plants. If a smaller number of seeds is planted in each hill there is often moisture enough in the ground to keep the vines growing late in the fall, and the late beans are sometimes damaged by early fall frosts. This problem must be worked out for each locality having different soil and moisture conditions.

On very steep land the rows should run straight up the hill. If the surface of the field to be planted slopes in more than one direction, it is frequently advisable to change the direction of the rows so that they will run straight up the hill on the steepest parts of the fields. This makes it much easier to cultivate and harvest the beans.

The double-row bean and corn planter is used almost exclusively for planting the crop. An excellent type of planter is shown in Figure 1. This planter may be adjusted to plant in rows from 28 to 44 inches apart. By using a special 30-inch wire it will also plant the hills in 30-inch cross checks. The feed plates may be made to drop the desired number of seeds in each hill by regulating their speed. The planter is equipped with an automatic hill-drop attachment which drops the hills from 17 to 52 inches apart in the row.

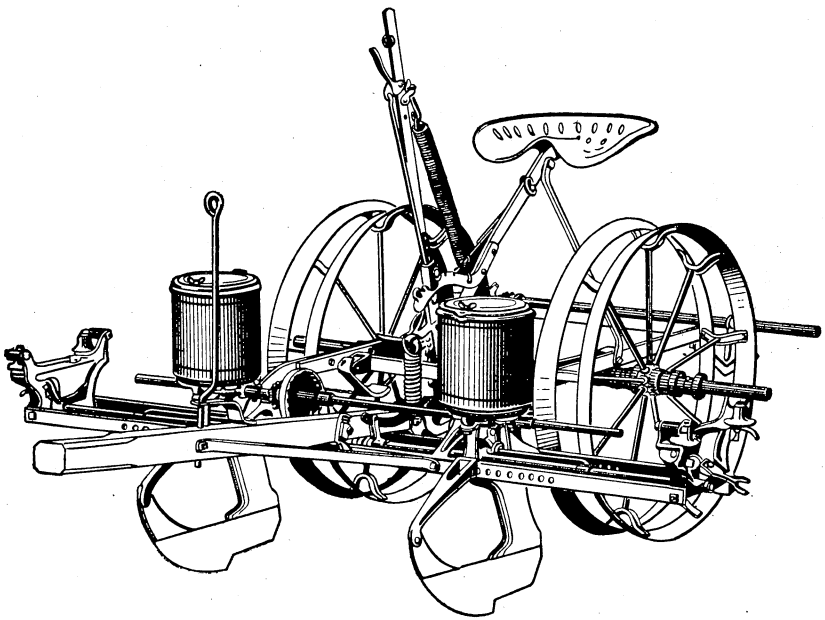

FIG. 1.—A double-row bean or corn planter

A hand corn planter is often used for planting where only a small acreage is to be grown. The ground is marked off in checks about 30 inches square and the beans dropped at the intersection of the marks. An experienced man can plant from 4 to 7 acres a day by this method. If the ground is free from weeds, so that little cultivation is necessary, the seed is often planted in drill rows with either a bean planter or an ordinary grain drill. Of the two, a bean planter which has a drill attachment is the more desirable.

A grain drill having feed cups which will handle beans may be used with fair success. An 11-row grain drill with spaces of 7 inches between the grain tubes can be adjusted for drilling beans in rows 28 inches apart by stopping up all of the feed cups except the second, sixth, and tenth. The machine is so regulated as to plant the seed from 3 to 6 inches apart in the row.

Depth at which the beans are planted depends upon the character of the soil and the weather conditions. They are not planted so deep in dark, heavy soil as in a lighter soil. Beans can not be planted to a very great depth during cold, damp weather without injuring the stand. The safe plan is to plant just deep enough for the seed to lie in moist earth, for an even stand of strong, healthy plants is one of the first requirements of a good bean crop.

INOCULATION

For the successful culture of beans there must be nodule-forming bacteria in the soil. If these bacteria are present they form on the roots of the bean plants little lumps called nodules. By the aid of the bacteria living in the nodules the bean plants are able to assimilate atmospheric nitrogen. Without the help of these bacteria they must obtain their nitrogen from the soil. If the nodule-forming bacteria are not present in the soil they may be supplied in either of two ways: (1) By pure-culture inoculation, or (2) by soil inoculation.

Pure-culture inoculation material is furnished to farmers by the Oregon Agricultural College, the Washington State College, and the University of Idaho. The United States Department of Agriculture furnishes it in small quantities for demonstrational purposes. Directions always accompany the pure-culture inoculating material.

Beans may be inoculated by using soil in either of two ways: (1) The beans to be treated are placed upon a tight floor, sprinkled with water, and shoveled over until each bean is wet. Only enough water should be used to wet the beans. The wet beans are then sprinkled with pulverized soil taken from a field or garden which in the previous year had produced beans with nodules on their roots. About 1 pint of soil is enough for a bushel of beans. After applying the soil the beans are again shoveled over until some of the dirt has stuck to each bean. (2) In the second method the inoculating soil is placed in a bucket of water and stirred until the soil lumps have disappeared. The seed is then sprinkled with the dirty water and thoroughly stirred with a shovel to insure the wetting of each seed. From 1 to 1½ pints of water should be enough for a bushel of seed.

In using either of these methods care should be taken to use only enough soil to place a very little on each seed. If too much soil is used it is difficult to get the seed through the drill. Since only a small quantity of soil is used, it should be gathered very carefully. Only soil which has been in direct contact with bean plants having plenty of nodules on their roots should be used. It should have been gathered during the previous summer and stored in a cellar or damp shady place until used.

It should also be understood that inoculation will do little or no good except on land which never produced beans before or on land where beans have partially failed because of the absence of the nodule-bearing bacteria. On land which has recently produced beans successfully it is not necessary to inoculate the seed. Where beans have partially failed because of poor inoculation, on the other hand, the crop should be grown continuously on the same land until the roots of the bean plants are well supplied with nodules.

CULTIVATION

A thorough preparation of the seed bed leaves the soil in excellent tilth, destroys most of the weeds, and materially lessens the cultiva-

tions necessary after the beans are planted. The number of cultivations depends upon so many factors that no fixed rule can be made to apply to every case. For this reason the statements which follow must be taken in a general sense.

If the ground is very foul the shovel cultivator is run immediately behind the planter. In two or three days, or just before the plants begin coming through the ground, the field is cultivated with a light drag harrow. The harrow destroys the small weeds, levels the surface of the ground, and puts the soil in splendid condition to be cultivated as soon as the plants are large enough. If weed seeds germinate at the same time as the beans, the ground is harrowed again after the plants are up.

Some growers fear to use the harrow lest they injure the stand by breaking off the young plants. Very little damage is done, however, if the seed bed has been so well prepared that the ground is level and free from clods and if a light harrow is used. Less damage will result if the harrowing is done when the surface soil and the bean

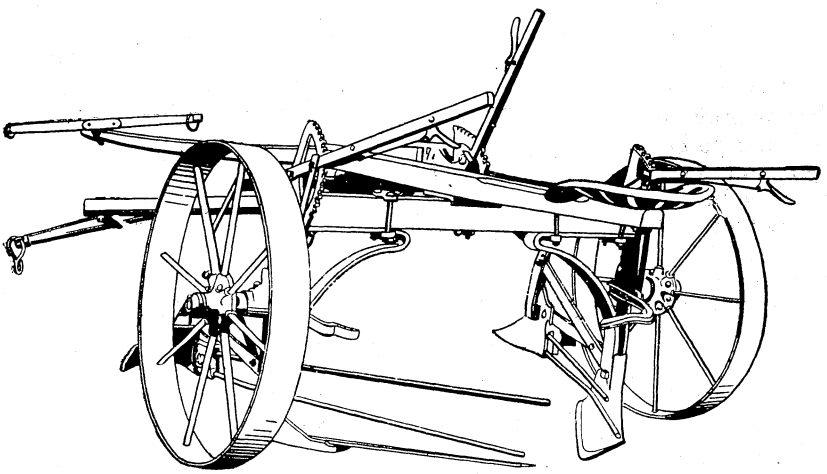

FIG. 2.—Double-row bean cutter generally used for harvesting the crop

plants are rather dry, as the young plants are more brittle when moist than when dry.

One harrowing, either before or after the plants are up, is enough if the ground is comparatively free from weeds. It should be done when the weeds are most easily destroyed. Two or three additional cultivations during the growing season are usually necessary. All cultivation given after the crop is well started should be shallow, for the bean is a surface feeder and deep cultivation is liable to disturb the rootlets and thus weaken the plant by diminishing the food supply.

Implements used in cultivating corn are the ones usually employed in bean culture. Sweeps are substituted for the shovels, as they are better adapted to shallow cultivation. Level cultivation is practiced at all times. Cultivation is discontinued when the vines begin blooming, for the flowers are easily knocked off, and late stirring of the soil keeps the plants growing, making them liable to injury by early fall frosts.

HARVESTING

In the bean-growing districts of Nez Perce and Latah Counties, Idaho, the bean harvest usually begins about September 10. The date varies from August 25 to September 20, according to the season, the altitude, and the varieties grown.

A double-row bean cutter similar to the one shown in Figure 2 is generally used for cutting the crop. One man with two good horses can cut from 12 to 14 acres a day with a machine of this kind. The double-row sled bean cutter shown in Figure 3 is also a satisfactory implement, especially on steep land, as the runners tend to prevent slipping down the hill. This implement requires three horses.

When the pods have turned yellow and before they have dried out, the vines are cut just below the surface of the ground. Either of the cutters here described cuts two rows at a time and forces the vines into one windrow. Two men with pitchforks follow immediately behind the cutter and place three of the windrows into one row of piles.

The plants are left piled in the field until the vines are thoroughly dry. It seldom takes more than two or three days for them

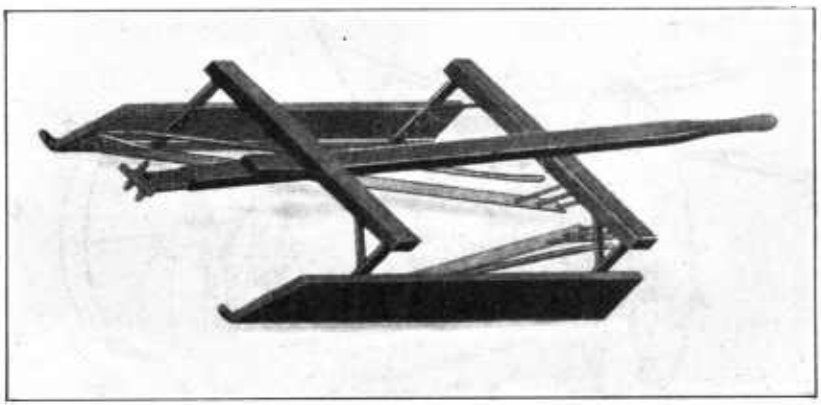

FIG. 3.—A double-row sled bean cutter

to become dry enough to be hauled to the bean huller or stacked in the field or in sheds. Stacking in the field before threshing is growing in favor, since stacking materially lessens the danger of damage from rain. It is during the time the beans are lying in piles between cutting and threshing that there is danger of damage from rain. If stacked, such damage is not liable to occur, as the stacking can begin within a couple of days after cutting and the beans are left in piles only a short time. Another advantage of stacking is that the vines go into a sweat soon after they are stacked and do not become thoroughly dry for three or four weeks after the sweating process begins. While in the sweat the vines, pods, and seed become toughened, and there is less danger of cracking than if threshed directly from the field.

The side-delivery rake (fig. 4) is now used very generally in harvesting beans in Lewis, Nez Perce, and Latah Counties, Idaho. Two rows of beans are thrown into one windrow by the bean cutter. After the beans are partially dry three of these windrows are thrown

together with the side-delivery rake, making a windrow composed of six bean rows. If good drying weather prevails the beans may be hauled direct from these large windrows to the thresher, stack, or bean shed. On the other hand, if the beans become wet, the windrows may be turned over with the side-delivery rake or they may be placed in piles. If a rain comes before the beans can be stacked they are turned as soon as the ground dries. The pods should lie but a short time on the wet earth, as the seeds absorb moisture readily and are liable to become discolored. Care must be exercised in handling the vines after they become thoroughly dry, for the pods crack open easily and much loss may result from shattering.

STACKING

The stacks are built on a layer of straw 12 or 14 inches thick to keep the pods from coming into contact with the ground. The straw also catches the seeds which are trampled out during the stacking process. The beans are separated from the straw by running both through the huller. Stacks are kept dry by covering them with heavy canvas. An excellent way to protect the beans until threshed is to cover them with straw. On the top of the stack the covering should be 12 to 15 inches deep. The straw is held in place by a network of wires or binder twine. Making the cover waterproof is important, for a leak may discolor the beans from the top to the bottom of the stack.

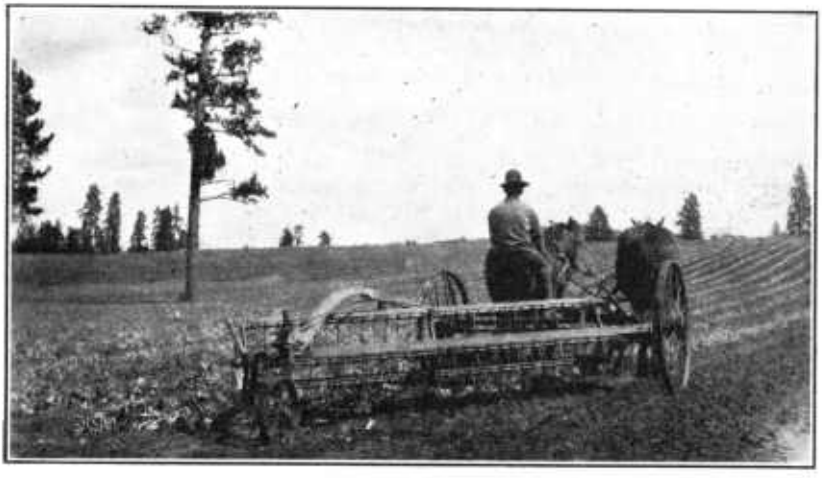

FIG. 4.—The side-delivery rake used in windrowing beans

A bean crop may sometimes ripen so late in the season and rains may come so frequently that it is impossible to get the vines dry enough to stack in the usual way. Crops caught in this condition have been saved by stacking in the driest possible condition in narrow stacks about 10 feet wide. During the construction of the stack, poles, rails, or fence posts are placed in it to give the beans ventilation. They are placed lengthwise of the stack and are separated by layers of beans from 18 to 24 inches thick. As the stacks must stand until the following spring or summer before the beans can be threshed, they must be well covered.

THRESHING

The threshing is usually done with a bean huller, a machine designed to minimize the loss from cracking. Good work may be done with a grain separator, provided the vines have remained in the stack long enough to be in the sweat and the speed of the cylinder is slowed down to 300 or 400 revolutions per minute, the speed depending on the diameter of the cylinder. All but one row of the concave teeth and half of the cylinder teeth are removed, the separating parts of the machine are run at the same rate as when threshing grain, and none of the threshed beans are allowed to pass from the elevator into the cylinder a second time.

In districts where beans are a staple crop the bean hullers make a regular fall run, the same as grain threshers. The usual charge for threshing the 1925 crop was 50 cents per sack, full sacks weighing from 140 to 150 pounds. This makes the charge about 35 cents per hundredweight. The charge includes all labor connected with threshing except hauling the vines from the field to the machine in case they are not stacked. Growers who have only a small acreage, or who live in a community where there are no hullers, do their threshing with a grain separator or by means of a flail. Two men can flail out and clean up about 1,800 pounds a day.

MARKETING THE CROP

Cleaning and grading to get a uniform and attractive product are very important items in the marketing of dry beans. As far as the farmer is concerned, this preparation usually ends with the threshing operation. Many of the grain warehouses in the bean-growing districts are equipped with special machinery for this work. The farmer delivers his beans to the warehouse just as they come from the bean thresher and about 6 per cent of the thresher run is made up of culls and foreign matter. The farmer receives a load check, and his beans are kept in a separate pile. He then has the choice of selling them in this condition, or having them recleaned, scoured, separated into two grades (large and small), and placed in sacks which usually weigh 100 pounds each. After this work is done the farmer receives a negotiable warehouse receipt in exchange for his load receipts. The minimum charge for recleaning, scouring, and grading is $2 per ton.

Before the war affected prices the growers usually received from $3 to $4.50 per hundredweight, the price varying according to the size and quality of the product. The smaller beans are most in demand and generally sell for 25 to 50 cents per hundredweight higher than the larger beans.

It is sometimes necessary to hand pick the crop on account of discolored beans if the harvest season is damp, but weather conditions do not usually make hand picking necessary if the crop is handled properly. The operation of hand picking is greatly facilitated by a small machine, operated by foot or other motive power, and consisting of a canvas belt 7 or 8 inches wide passing over rollers driven at a low speed. The beans are fed to the belt from a hopper, and as they are carried along the pickers remove the discolored seed and foreign particles. The sound beans pass to the end of the canvas and drop into a sack or other receptacle. The usual charge for hand picking is 7 cents a pound for the damaged beans picked out.

KINDS OF BEANS GROWN

The beans grown most extensively in these districts are the large white (Lady Washington), the small white (Little Navy), and the Red Mexican or Red Minor (called the "California Red" in California). There are several strains of the small white beans which have minor characteristics. These strains are grown under such names as "Banner Leafless," "Prolific Tree," and "Prize Winner." The Red Mexican is the earliest of the three types and is preferred for late planting or at high altitudes where the season is short.

The "Robust," a strain selected by the Michigan Agricultural Experiment Station from a lot of commercial pea beans, has been introduced into northern Idaho. The Robust is said to be very resistant to mosaic and partially so to blight and anthracnose. It gives promise also of yielding more in northern Idaho than either the small or large white.[2]

IMPROVING THE CROP BY SEED SELECTION

By carefully studying a field of maturing beans a wide variation in the individual plants will be observed. It will be seen that some of the plants are mature, while others are still green; that some are heavily laden with well-filled pods, while others bear only a small number of seeds. On account of this variation it is possible to improve the crop greatly by careful seed selection. The object of such selection is to increase the yield and vitality of the seed, to improve its quality, and to produce plants that will ripen evenly. In certain localities it is also desirable to select early maturing plants in order to shorten the time required for maturing the seed. It is impossible to obtain permanent results unless such selection is practiced every year, for bean plants have a strong tendency, if selection ceases, to return to the original type.

A practical method of seed improvement used by the most successful plant growers is as follows: In starting the work a large number of plants heavily laden with ripe pods are selected from the field at the time of maturity. The plants are taken from parts of the field where the stand is uniform and from soil which is representative of the general soil conditions. Plants from the outside rows or where the stand is poor are not representative and must not be used in seed selection.

The plants are pulled by hand, removed from the field, and carefully inspected to obtain the 25, 50, or 100 which are best. These are threshed individually and the beans from each plant are put in separate paper bags, which are numbered.

The following year these selected seeds are planted by hand, a separate row for each paper bag. Toward harvest time this will be the most interesting plat on the farm, since the grower will soon see that when selecting his best plants the preceding fall in many cases he did not "know beans." A number of rows in this plat will be found to have produced progeny which are distinctly inferior in some respect. Here the advantage of these "progeny rows" will be apparent, since the grower is able to discard the bad rows entirely, where as if he had not planted the seed from each selected plant by itself it would be practically impossible to remove the

[2] For further information concerning the Robust strain of the Michigan pea bean, see Mich. Exp. Sta. Special Bul. Nos. 108 and 129.

poorer types by roguing. One or more rows will be found to be markedly better than the rest. All of these good rows should be saved for next year's seed plat. After discarding a few rows which may be distinctly poor, the remainder of the seed plat can be used to plant the field.

By one year's individual selection a strain can be established which can be kept fairly pure by discarding all the inferior plants from the seed plat. The plat should be sown each year and should be large enough to furnish all the planting seed needed. The extra labor in threshing which this selection plan requires comes at a time of year when it can be spared, since the selected plants may be stored unthreshed for a while. The labor of hand planting will be richly repaid by the greater producing value of a selected strain of beans.

BY-PRODUCTS

The value of bean straw as a rough feed is not fully appreciated by all growers. Many farmers feed their bean straw, but much of it is burned immediately after threshing. Others allow it partly to decay in large piles and then use it as filling for ditches or as a fertilizer. When not allowed to become damp or moldy, bean straw makes an excellent roughage for either sheep or cattle, and when fed in conjunction with grain it is a good substitute for hay.

Bean straw is but little inferior in feeding value to wheat, oat, and barley hay. The yield of bean straw per acre is ordinarily from one-half to three-quarters of a ton. The value of the straw per acre can be estimated closely by the current prices of grain hay.

Little waste is caused from decay or discoloration of the seed during harvest, but sometimes there is a quantity of cull beans due to the splitting or cracking of the seed during threshing. These culls make good hog feed when thoroughly cooked and fed with other grain.

PRODUCTION IN COMPETING AREAS

The commercial crop of dry edible beans of the United States is practically all produced in Michigan, California, New York, Colorado, New Mexico, Idaho, and Montana. A small percentage of the crop is produced in Maine, Vermont, Wisconsin, Minnesota, Wyoming, and Arizona. Table 1 presents substantially the harvested acreage of the commercial crop for the years 1914–1925, inclusive.

TABLE 1.—*Beans, dry edible: Harvested acreage*[1] *in designated States, 1914 to 1925, inclusive*

[Thousand acres, i. e., 000, omitted]

State	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925[2]
Michigan	490	506	470	537	543	315	286	263	458	568	614	614
California	215	225	340	558	592	472	300	272	324	299	179	240
New York	118	130	190	250	200	46	54	67	108	130	155	132
Colorado	20	21	38	250	252	66	52	39	81	170	280	320
New Mexico	32	46	64	207	141	115	114	105	62	69	174	114
Arizona	-------	-------	5	19	16	10	7	8	7	6	5	5
Idaho	-------	-------	-------	-------	-------	36	25	18	26	45	65	72
Montana	-------	-------	-------	-------	-------	-------	-------	-------	4	23	34	40
Other states	-------	-------	-------	-------	-------	-------	-------	5	9	10	39	42
Total	875	928	1,107	1,821	1,744	1,060	838	777	1,079	1,320	1,545	1,579

[1] Substantially the commercial crop.

[2] Preliminary.

Compiled from office records, Division of Crop and Livestock Estimates, Bureau of Agricultural Economics.

Acreage devoted to dry beans has increased materially during recent years. At the beginning of the World War about 900,000 acres were harvested annually. The war greatly increased the demand for dry beans, and as a result the average farm price advanced from around 4 cents per pound in 1913 and 1914 to as much as 15 cents in the spring of 1917. Under this price stimulus production increased rapidly, 1,821,000 acres being harvested in 1917. The acreage then decreased each year until 1921, when about 777,000 acres were harvested. Since 1921 there has been a steady increase, reaching 1,579,000 acres in 1925.

TABLE 2.—*Beans, dry edible: Production in designated States, 1914 to 1925, inclusive* [1]

[Thousand bushels, i. e., 000, omitted]

State	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925 [2]
Michigan	5,488	4,250	3,102	3,294	4,887	4,347	3,718	2,972	4,809	6,532	6,447	8,289
California	3,875	3,868	5,576	8,091	8,584	6,561	3,000	3,618	5,346	4,694	2,417	4,080
New York	1,650	1,495	1,140	1,875	1,660	667	756	1,072	1,512	1,690	2,015	1,426
Colorado	300	340	424	1,950	1,638	429	416	312	405	1,360	952	2,240
New Mexico	272	368	425	683	564	862	855	840	198	345	870	399
Arizona	-------	-------	48	152	64	87	44	68	24	39	30	40
Idaho	-------	-------	-------	-------	-------	396	288	216	364	990	1,268	1,584
Montana	-------	-------	-------	-------	-------	-------	-------	-------	52	264	408	500
Other States	-------	-------	-------	-------	-------	-------	-------	52	83	123	449	542
Total	11,585	10,321	10,715	16,045	17,397	13,349	9,077	9,150	12,793	16,037	14,856	19,100

[1] Substantially the commercial crop. [2] Preliminary.

Compiled from office records, Division of Crop and Livestock Estimates, Bureau of Agricultural Economics.

Production of the dry bean crop is shown in Table 2. Just prior to the World War the average annual production of the commercial crop was around 11 million bushels. Under the impetus given the industry by the war production increased to fully 16 million bushels in 1917 and over 17 million in 1918. At that time the markets were glutted and prices began to decline late in 1917. As a result production dropped to below pre-war level in 1920 and 1921. Stocks became relatively low early in 1922, and since that year there has been a decided upward trend in production. The drop in the total production in 1924 as compared with that of 1923 (Tables 2 and 3) was due to a very low average yield per acre, the harvested acreage being 225,000 acres greater in 1924 than in 1923.

There has been a decided upward trend in our domestic requirements during the last decade. At the beginning of the war about 11 to 12 million bushels were consumed annually, whereas at present our total need for all purposes is fully 15 to 16 million bushels. The 1925 crop, it thus appears, exceeds our domestic needs by some 3 or 4 million bushels. The 1925 crop, however, contained an unusually large percentage of damaged beans which when subtracted from the total production materially reduced the quantity of beans suitable for human food. Production in 1925 would have been much greater except for the abandonment of 10 per cent of the planted acreage in Michigan and 25 per cent in New York and the heavy loss sustained at harvest time in some of the producing areas because of unfavorable weather conditions.

TABLE 3.—*Beans, dry, white: Estimated production in designated States, 1922 to 1925, inclusive*[1]

[Thousand bushels; i. e., 000 omitted]

State	1922	1923	1924	1925
Michigan	4,424	6,009	5,673	7,128
New York	650	727	564	428
Minnesota	84	121	100	104
Wisconsin	72	85	80	128
California	856	845	217	489
Idaho	291	772	951	1,331
Montana	40	224	388	440
Wyoming	4	20	82	110
Total 8 States	6,421	8,803	8,055	10,158

[1] These estimates include the following: The small and medium pea beans grown in Michigan, New York, Minnesota, and Wisconsin; the small whites and the large whites grown in California and Idaho; and the Great Northern grown in Idaho, Montana, and Wyoming.

Compiled from office records, Division of Crop and Livestock Estimates, Bureau of Agricultural Economics.

The bean crop as a whole is made up of a number of very distinct classes or varieties which enter into a somewhat complex trade. The normal demand for several of these classes has become so fixed and well defined that they are only indirectly competitive. Some kinds of beans are preferred for baking, others for soup, and others for preparing canned products. Furthermore different markets frequently have varying preferences. For these reasons the price of a particular class of beans may react more strongly to the supply of that class than to the supply of the bean crop as a whole.

Of the total crop of dry beans more than 50 per cent are white beans. The different kinds of white beans are more directly competitive than are the other classes of beans. The white pea bean of Michigan and New York constitutes fully 75 per cent of the total commercial crop of white beans (Table 3), and for this reason largely dominates the price of practically all white beans.

The district to which this bulletin is applicable produces, in the main, two classes of beans, the small white (Little Navy) and large white (Lady Washington). After supplying the local trade these beans are shipped east and to the Pacific coast cities. They are marketed chiefly in competition with (1) white pea beans grown in Michigan, New York, Wisconsin, and Minnesota; (2) the small and large whites of California; and (3) the Great Northern, a large white bean grown in southern Idaho, Montana, and Wyoming.

Production of dry beans can be expanded greatly and quickly in practically all producing areas. This was demonstrated during the war, when the harvested acreage of the commercial crop was increased from 875,000 acres in 1914 to 1,821,000 acres in 1917. To stabilize the industry the acreage planted to the respective classes of beans in the various producing areas should be adjusted carefully to the market requirements of these classes. A reduction of the bean acreage in northern Idaho, however, is not to be expected, since beans replace summer fallow in the cropping system of this district.

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